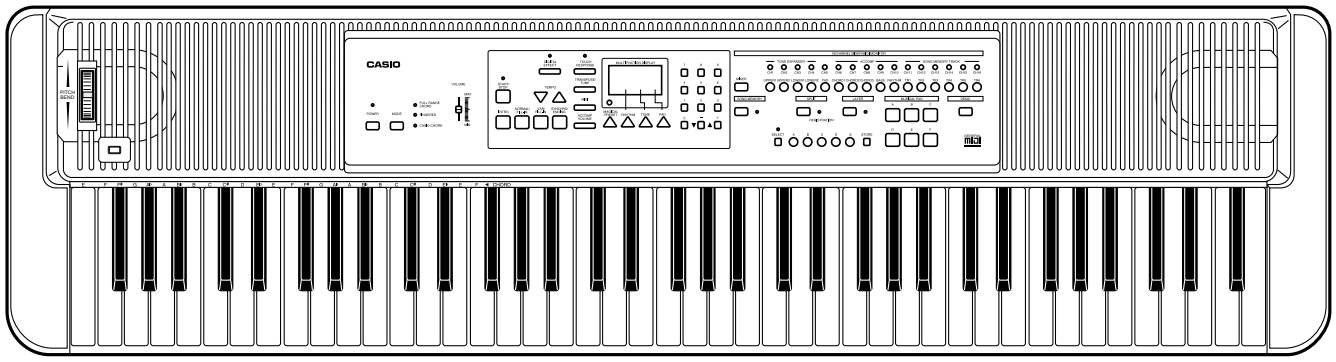
CASIO®

Service Manual

(without price)

WK-1500



WK-1500

GM SOUND KEYBOARD

INDEX

MC-Service

CONTENTS

Specifications 2
Block Diagram 4
Circuit Description 5
Major Waveforms 13
Printed Circuit Boards 14
Schematic Diagrams 15
Exploded View 19
Parts List 21

SPECIFICATIONS

GENERAL

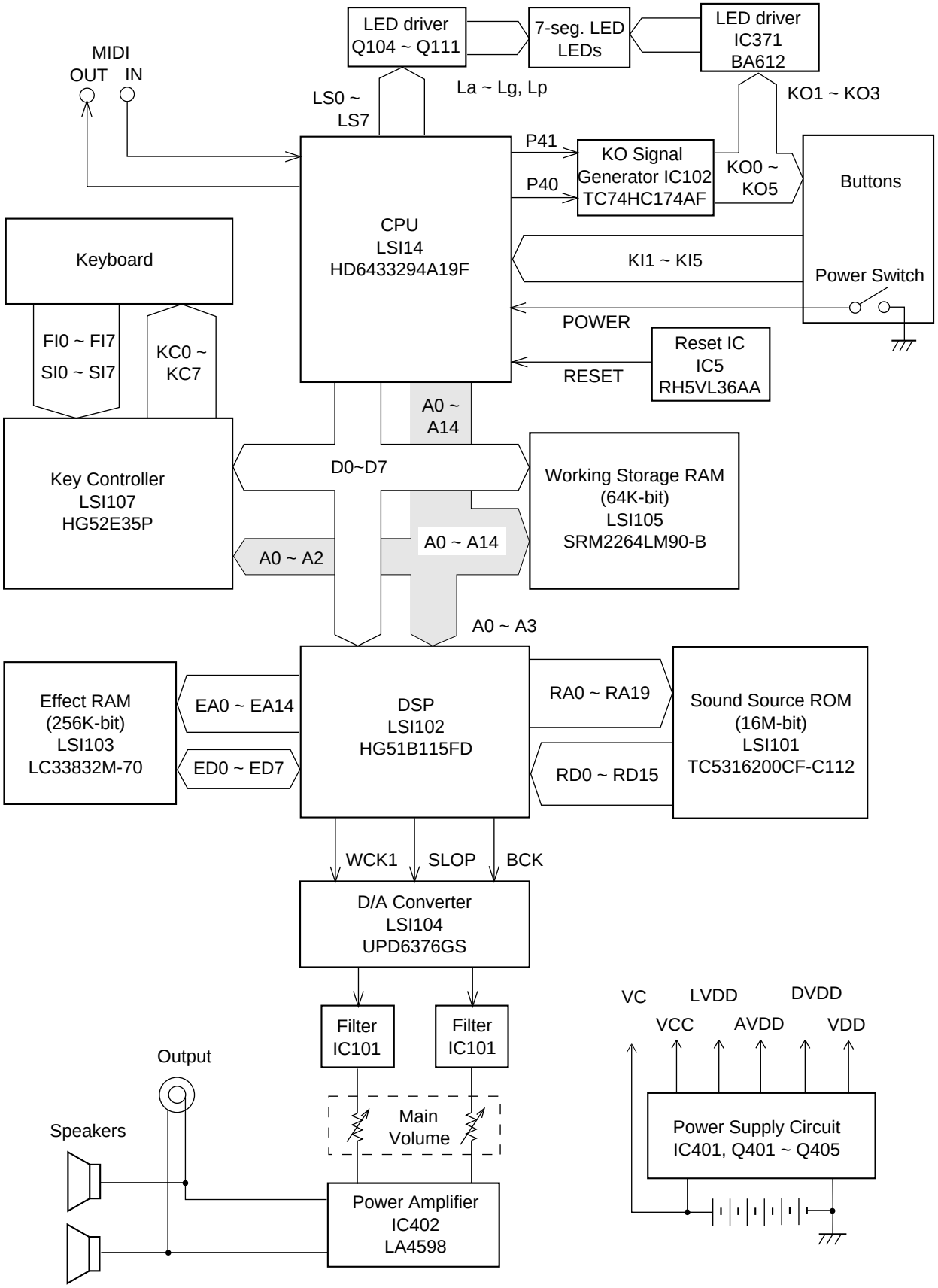
Number of keys:	76
Polyphonic:	32-note
Digital effects:	10 REVERB 1, REVERB 2, REVERB 3, CHORUS, TREMOLO, PHASE SHIFTER, ORGAN SPEAKER, ENHANCER, FLANGER, LOUDNESS
Pads:	180 (six pads × 30 sets) Phrases (22 sets), drums/percussion (8 sets) Melody tone matches chord
Demo tunes:	3, sequential repeat playback
Auto-accompaniment	
Rhythm patterns:	100
Tempo:	Adjustable (216 levels, ♩ = 40 to 255)
Chords:	3 types (CASIO Chords, Fingered, Full-Range Chords)
Pads:	Rhythm, bass, Chord 1, Chord 2, Chord 3 (adjustable on/off, tone, volume, pan, effect send, fine tune, coarse tune, expression settings)
Magical presets:	50 types (Break beat, Melodycomp, Shadow Drum, Free Session)
Registration memory:	10 Tone changes, tempo setting, auto-accompaniment volume setting, mode, layer on/off, Mixer settings, effect type, split on/off, rhythm type, auto-accompaniment rhythm assignment, pad type, chord fingering method, touch response setting, MIDI settings (including assignable jack settings), Magical Preset type
Mixer	
Number of channels:	16
Parameters:	TONE, VOLUME, PAN, EFFECT SEND, FINE TUNE, COARSE TUNE, EXPRESSION, MUTE
MIDI monitor:	16 LED monitor
Song memory	
Number of songs:	2
Tracks:	6 (individual adjustment of on/off, tone, volume, pan, effect send, fine tune, coarse tune, expression)
Type:	Real-time
Capacity:	Approximately 5,200 notes
Other functions	
Transpose:	25 levels (1 octave lower C to 1 octave upper C)
Tuning:	Adjustable: A4 = 440 Hz ± 50 cents
Pitch Bender:	Adjustable range: ± 12 semitones
Tone Expander:	Individual adjustment of volume, tuning, pan, effect send for each layer and split tone

MIDI:	16-timbre multi-timbre receive (General MIDI Level 1)
Built-in speakers:	12 cm diameter × 2 (output: 5 W + 5 W)
Input/Output Jacks	
Power supply:	12 V DC
Headphones:	Stereo standard jack
Output jacks:	Output impedance: 100 Ω Output voltage 2.5 V (RMS) MAX
Assignable Jack:	Standard jack (sustain, sostenuto, soft, rhythm start/stop)
MIDI terminals:	IN, OUT
Auto power off:	Approximately 6 minutes after the last operation
Power source:	2-way AC or DC source AC: AC adaptor DC: 6D size dry batteries
Power consumption:	18 W
Dimensions (HWD):	116.1 × 30.2 × 11.0 mm (45-3/4 × 11-7/8 × 4-5/16 inches)
Weight:	6.8 kg (15.0 lbs) excluding batteries

ELECTRICAL

Current drain with 9 V DC:		
No sound output		480 mA ± 20%
Maximum volume with 10 polyphonic notes in tone No. 081 Volume; maximum		1720 mA ± 20%
Phone output level (Vrms with 8 load each channel): with key C2 pressed in tone No. 042	Left channel	175 mV ± 20%
Line output level (Vrms with 47 k load each channel): with key C2 pressed in tone No. 042	Left channel	1420 mV ± 20%
Minimum operating voltage:		12.0 V

BLOCK DIAGRAM

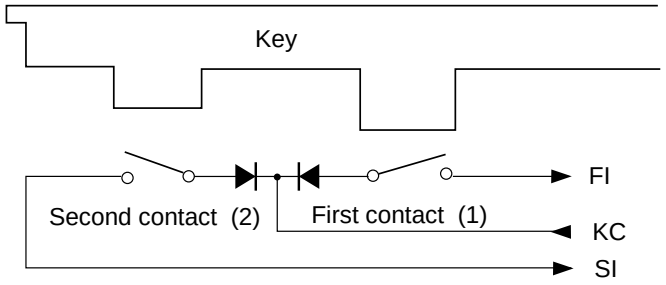


CIRCUIT DESCRIPTION

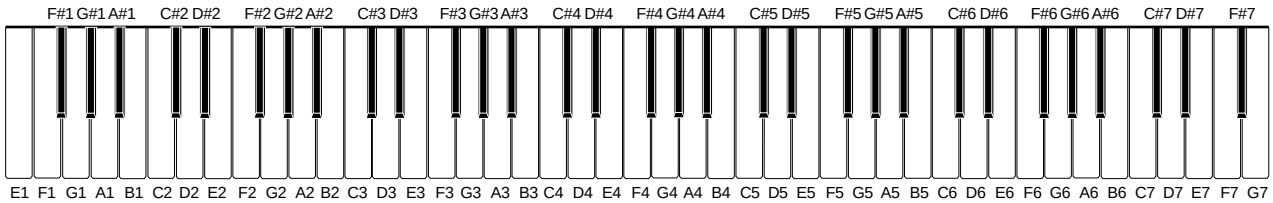
KEY MATRIX

	KC0	KC1	KC2	KC3	KC4	KC5	KC6	KC7
FI0		E1 (1)	F1 (1)	F#1 (1)	G1 (1)	G#1 (1)	A1 (1)	A#1 (1)
SI0		E1 (2)	F1 (2)	F#1 (2)	G1 (2)	G#1 (2)	A1 (2)	A#1 (2)
FI1	B1 (1)	C2 (1)	C#2 (1)	D2 (1)	D#2 (1)	E2 (1)	F2 (1)	F#2 (1)
SI1	B1 (2)	C2 (2)	C#2 (2)	D2 (2)	D#2 (2)	E2 (2)	F2 (2)	F#2 (2)
FI2	G2 (1)	G#2 (1)	A2 (1)	A#2 (1)	B2 (1)	C3 (1)	C#3 (1)	D3 (1)
SI2	G2 (2)	G#2 (2)	A2 (2)	A#2 (2)	B2 (2)	C3 (2)	C#3 (2)	D3 (2)
FI3	D#3 (1)	E3 (1)	F3 (1)	F#3 (1)	G3 (1)	G#3 (1)	A3 (1)	A#3 (1)
SI3	D#3 (2)	E3 (2)	F3 (2)	F#3 (2)	G3 (2)	G#3 (2)	A3 (2)	A#3 (2)
FI4	B3 (1)	C4 (1)	C#4 (1)	D4 (1)	D#4 (1)	E4 (1)	F4 (1)	F#4 (1)
SI4	B3 (2)	C4 (2)	C#4 (2)	D4 (2)	D#4 (2)	E4 (2)	F4 (2)	F#4 (2)
FI5	G4 (1)	G#4 (1)	A4 (1)	A#4 (1)	B4 (1)	C5 (1)	C#5 (1)	D5 (1)
SI5	G4 (2)	G#4 (2)	A4 (2)	A#4 (2)	B4 (2)	C5 (2)	C#5 (2)	D5 (2)
FI6	D#5 (1)	E5 (1)	F5 (1)	F#5 (1)	G5 (1)	G#5 (1)	A5 (1)	A#5 (1)
SI6	D#5 (2)	E5 (2)	F5 (2)	F#5 (2)	G5 (2)	G#5 (2)	A5 (2)	A#5 (2)
FI7	B5 (1)	C6 (1)	C#6 (1)	D6 (1)	D#6 (1)	E6 (1)	F6 (1)	F#6 (1)
SI7	B5 (2)	C6 (2)	C#6 (2)	D6 (2)	D#6 (2)	E6 (2)	F6 (2)	F#6 (2)
FI8	G6 (1)	G#6 (1)	A6 (1)	A#6 (1)	B6 (1)	C7 (1)	C#7 (1)	D7 (1)
SI8	G6 (2)	G#6 (2)	A6 (2)	A#6 (2)	B6 (2)	C7 (2)	C#7 (2)	D7 (2)
FI9	D#7 (1)	E7 (1)	F7 (1)	F#7 (1)	G7 (1)			
SI9	D#7 (2)	E7 (2)	F7 (2)	F#7 (2)	G7 (2)			

Note: Each key has two contacts, the first conatct (1) and second contact (2).



NOMENCLATURE OF KEYS



BUTTON MATRIX

	KI1	KI2	KI3	KI4	KI5	KI6	KI7
KO0	SPLIT	LAYER	CH7/CHORD2	CH8/ CHORD3	CH9/BASS	CH10/ RHYTHM	
KO1	TRANSPOSE /TUNE	MAGICAL PRESET	MIDI		RHYTHM	TONE	PAD
KO2			CH4/LOWER2	CH5/PAD	CH6/ CHORD1	CH2/ UPPER2	CH3/ LOWER1
KO3	3	6	9	DEMO	TOUCH RESPONSE	DIGITAL EFFECT	
KO4	2	5	8	CH1/ UPPER1	1	4	7
KO5	ACM VOLUME	SONG MEMORY	MODULATION	MIXER	0	–	+
KO6	SYNCH/ ENDING	VAR./FILL-IN	NORMAL/ FILL–IN	INTRO	F	E	D
KO7	MODE	A	B	C	START/ STOP	TEMPO DOWN	TEMPO UP
KO8	CH11/TR1	CH12/TR2	CH13/TR3	CH14/TR4	CH15/TR5	CH16/TR6	
KO9	BANK SELECT	A	B	C	D	E	STORE

POWER SUPPLY CIRCUIT

The power supply circuit generates six voltages as shown in the following table. VDD voltage is always generated. The others are controlled by APO signal output from the CPU.

Name	Voltage	For operation of
VDD	+5.2 V	CPU, Reset IC, Working storage RAM, KO signal generator
DVDD	+5.3 V	DSP, Key touch LSI, Sound source ROM, Effect RAM
AVDD	+5.1 V	DAC, Filter
LVDD	+5.2 V	LED Driver
VCC	+12 V	Pilot lamp
VC	+12 V	Power amplifier

CPU (LSI14: HD6433294A19F)

The 16-bit CPU contains a 32k-bit ROM, a 1k-bit RAM, seven 8-bit I/O ports, an A/D convertor and MIDIl interfaces. The CPU accesses to the working storage RAM, the DSP and the key touch LSI. The CPU interprets MIDI message using the working storage RAM. The CPU also controls buttons and LEDs.
The following table shows the pin functions of LSI14.

Pin No.	Terminal	In/Out	Function
1	P50/TXD	Out	MIDI signal output
2	P51/RXD	In	MIDI signal input
3	P52/SCK	Out	Reset signal output
4	-RESET	In	Reset signal input
5	-NMI	In	Power ON trigger signal input
6	VCC	In	+5 V source
7	-STBY	In	Standby signal input. Connected to +5 V.
8	VSS	In	Ground (0 V) source
9, 10	XTAL, EXTAL	In	20 MHz clock input
11, 12	MD1, MD0	In	Mode selection input
13	AVSS	In	Ground (0 V) source
14	P70	In	Analog input terminal for the pitch bend wheel
15 ~ 21	P71 ~ P77	Out	Input terminals from keys (KI1 ~ KI7)
22	AVCC	In	+5 V source
23 ~ 30	P60 ~ P67	Out	LED drive signal output
31	VCC	In	+5 V source
32 ~ 48	A0 ~ A15	Out	Address bus
40	VSS	In	Ground (0 V) source
49 ~ 56	D0 ~ D7	In/Out	Data bus
57	P40	Out	Clock for KO signal generator
58	P41	Out	KO signal data
59	P42	Out	APO signal output
60	P43	Out	Read enable signal output
61	P44	In	Write enable signal output
62	P45	—	Not used
63	P46	Out	10 MHz clock output
64	P47	—	Not used. Connected to +5 V source.

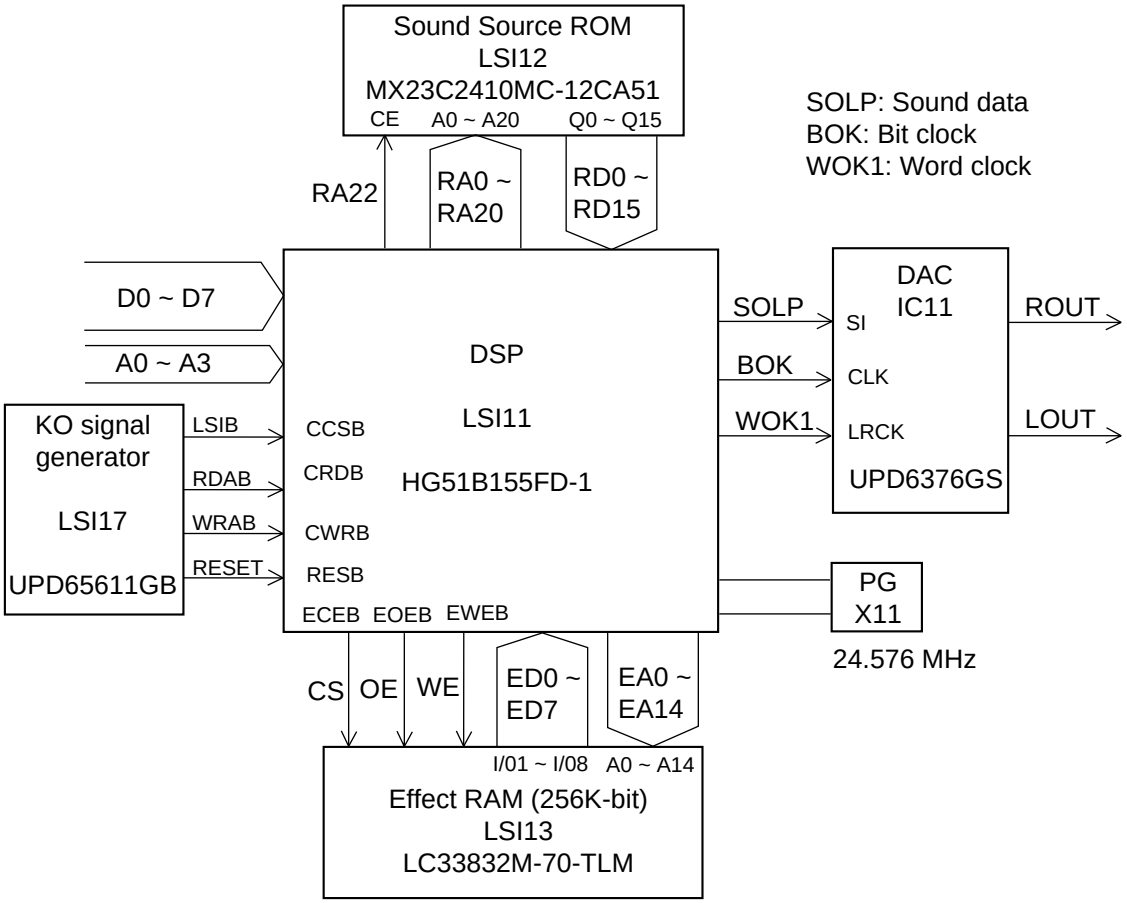
DIGITAL SIGNAL PROCESSOR (LSI11: HG51B155FD-1)

Upon receipt of note numbers and their velocities, the DSP reads sound and velocity data from the sound source ROM in accordance with the selected tone; the DSP can read rhythm data simultaneously when a rhythm pattern is selected. Then it provides 16-bit serial signal containing data of the melody, chord, bass, and percussion to the DAC. When an effect selected, the DSP adds the effect to the sound data using a 256k-bit RAM.
The following table shows the pin functions of LSI11.

Pin No.	Terminal	In/Out	Function
1 ~ 8	CD0 ~ CD7	In/Out	Data bus
9, 10	CE1, TRSB	—	Not used
11	GND7	In	Ground (0 V) source
12	CK16	Out	Terminal for 24.576 MHz clock check point
13	VCC6	In	+5 V source
14	CK0	In	Clock input. Connected to terminal CK16.
15	TCKB	—	Not used
16	VCC1	In	+5 V source
17	GND1	In	Ground (0 V) source
18, 19	XT0, XT1	In/Out	24.576 MHz clock input/output
20	SGL	In	System control terminal. Single chip system: Open
21	CCSB	In	Chip select signal input
22 ~ 25	CA0 ~ CA3	In	Address bus
26	CE0	In	Not used. Connected to ground.
27	CWRB	In	Write enable signal
28	CRDB	In	Read enable signal
29 ~ 32	—	—	Not used
33	RESB	In	Reset signal input
34	TESB	In	Not used. Connected to +5 V.
35 ~ 39	—	—	Not used
40 ~ 49 52 ~ 57	RD0 ~ RD15	In	Data bus for the sound source ROM
50	VCC2	In	+5 V source
51	GND2	In	Ground (0 V) source
58	RA23	Out	Not used
59	RA22	Out	Chip select signal for the sound source ROM
60	RA21	Out	Not used
61 ~ 73 75 ~ 82	RA0 ~ RA20	Out	Address bus for the sound source ROM
74	GND5	In	Ground (0 V) source
83	WOK2	Out	Not used
84	VCC3	In	+5 V source
85	GND3	In	Ground (0 V) source
86	WOK1	Out	Word clock for the DAC
87	SOLM	Out	Not used
88	SOLP	Out	Serial sound data output
89	BOK	Out	Bit clock output
90 ~ 92	—	—	Not used
93	VCC5	In	+5 V source
94, 95 97 ~ 105 107, 109 110, 112	EA0 ~ EA14	Out	Address bus for the effect RAM
96	EWEB	Out	Write enable signal for the effect RAM

Pin No.	Terminal	In/Out	Function
106	EOEB	Out	Read enable signal output for the effect RAM
108	VCC7	In	+5 V source
111	ECEB	Out	Chip select signal output for the effect RAM
113 ~ 117	ED11 ~ ED15	—	Not used
118	VCC4	In	+5 V source
119	GND4	In	Ground (0 V) source
120 ~ 122	ED8 ~ ED10	—	Not used
123 ~ 130	ED0 ~ ED7	In/Out	Data bus for the effect RAM
131	GND6	In	Ground (0 V) source
132 ~ 134	—	—	Not used. Connected to ground.
135, 136	—	—	Not used

Block diagram of DSP and DAC circuit



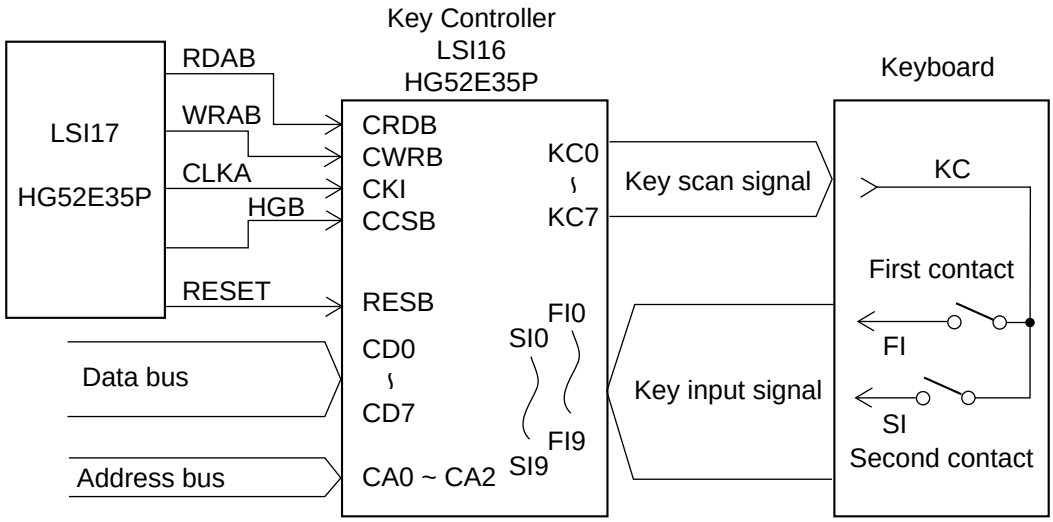
DAC (IC11: UPD6376GS)

The DAC receives 16-bit serial data output from the DSP. The data contains digital sound data of the melody, chord, bass, and percussion for the right and left channels. The DAC converts the data into analog waveforms by each channel and output them separately.
The following table shows the pin functions of IC11.

Pin No.	Terminal	In/Out	Function
1	SEL	In	Mode selection terminal. Connected to ground.
2	D.GND	In	Ground (0 V) source for the internal digit circuit
3	NC	—	Not used.
4	DVDD	In	+5 V source for the internal digital circuit
5	A.GND	In	Ground (0 V) source for the right channel
6	R.OUT	Out	Right channel sound waveform output
7, 8	A.VDD	In	+5 V source for the internal analog circuit
9	R.REF	In	Right channel reference voltage terminal
10	L.REF	In	Left channel reference voltage terminal
11	L.OUT	Out	Left channel sound waveform output
12	A.GND	In	Ground (0 V) source for the left channel
13	LRCK	In	Word clock input
14	LRSEL	In	Not used. Connected to ground.
15	SI	In	Sound data input
16	CLK	In	Bit clock input

KEY CONTROLLER (LSI16: HG52E35P)

The key controller generates key scan signals and provides them to the keyboard. By counting the time between first-key input signal FI and second-key SI from the keyboard, the key controller detects key velocity. The note number and its velocity data are read at regular intervals by the CPU.

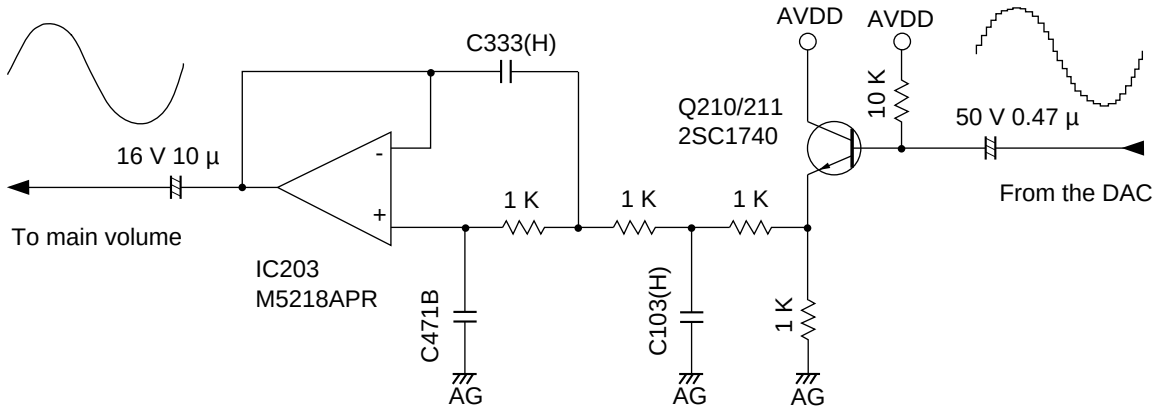


The following table shows the pin functions of LSI16.

Pin No.	Terminal	In/Out	Function
1	REQB	Out	Not used.
2, 3, 60 ~ 63	FI8 ~ FI10, SI8 ~ SI10	In	Not used. Connected to +5 V.
4	VCC	In	+5 V source
5	CRDB	In	Read enable signal input
6	CWRB	In	Write enable signal input
7	CCSB	In	Chip select signal input
8, 9, 11	T, STBY, W	In	Not used. Connected to +5 V.
10	RESB	In	Reset signal input
12	CKI	In	10 MHz clock input
13, 14	TMD, TST	In	Not used. Connected to ground.
15	CKO	Out	Not used.
16	GND	In	Ground (0 V) source
17	XIN	In	Not used. Connected to ground.
18	XOUT	Out	Not used.
19	TRES	In	Not used. Connected to ground.
20 ~ 23, 25 ~ 28	CD0 ~ CD7	In/Out	Data bus
24	GND	In	Ground (0 V) source
29 ~ 31	CA0 ~ CA2	In	Address bus
32	VCC	In	+5 V source
33 ~ 39, 41 ~ 43, 53 ~ 55, 57 ~ 63	FI0 ~ FI9, SI0 ~ SI9	In	Key input signal input
40	VCC	In	+5 V source
44 ~ 47, 49 ~ 52	KC0 ~ KC7	Out	Key scan signal
48, 56	GND	In	Ground (0 V) source
64	VCC	In	+5 V source

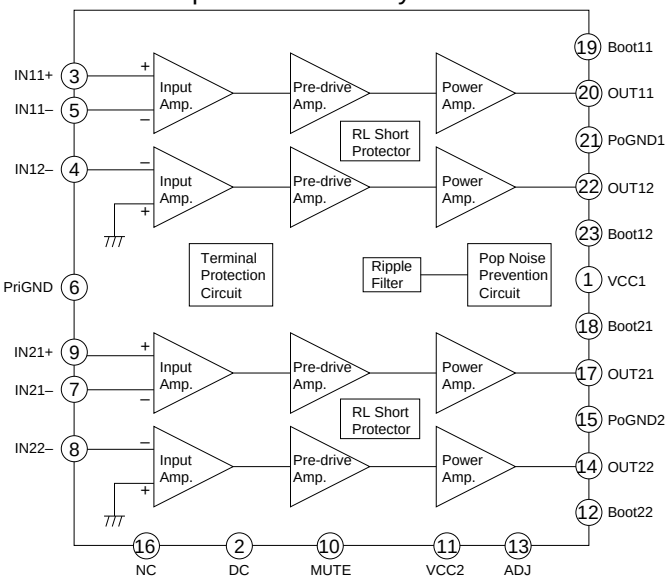
FILTER BLOCK

Since the sound signals from the DAC are stepped waveforms, the filter block is added to smooth the waveforms.

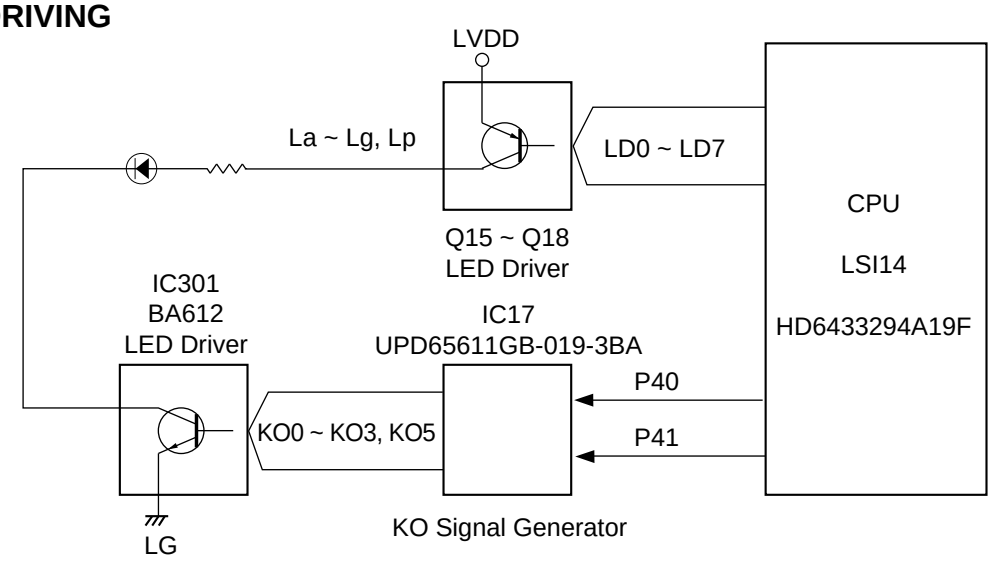


POWER AMPLIFIER (IC201: LA4620)

The power amplifier is a two-channel amplifier with standby switch.

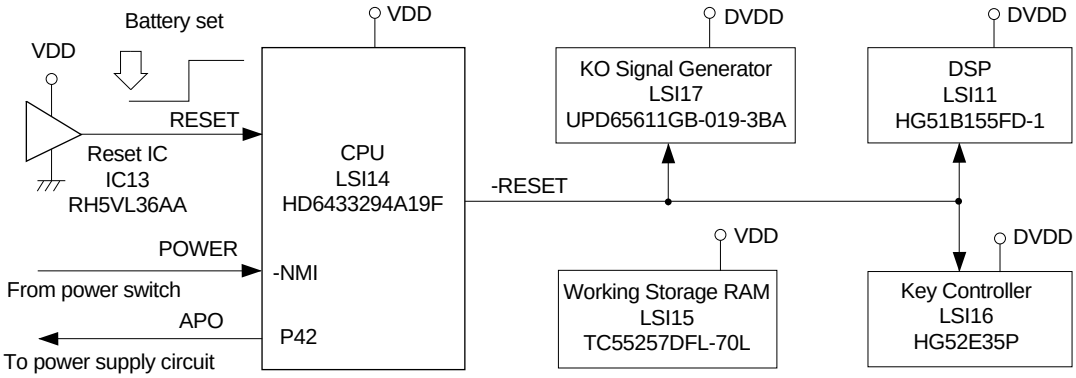


LED DRIVING

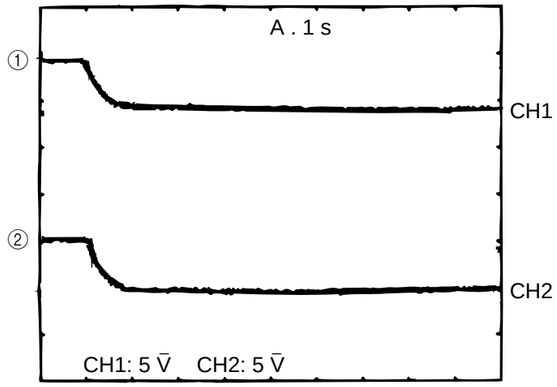


RESET CIRCUIT

When batteries are set or an AC adapter is connected, the reset IC provides a low pulse to the CPU. The CPU then initializes its internal circuit and clears the working storage RAM.
When the power switch is pressed, the CPU receives a low pulse of POWER signal. The CPU provides APO signal to the power supply circuit and raises RESET signal to +5 V to reset the DSP, the key controller and the KO signal generator.

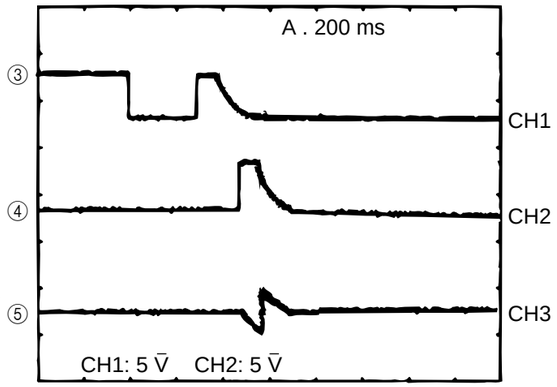


MAJOR WAVEFORMS



① Voltage VDD
JG connector pin 8

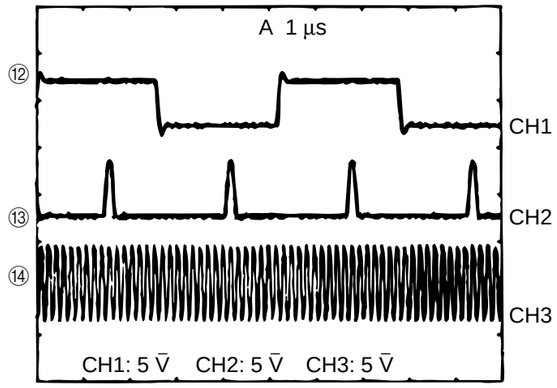
② Initial reset signal
RH5VL36A pin 1



③ Power ON signal PSW
HD6433294A19F pin 5

④ APO signal
HD6433294A19F pin 59

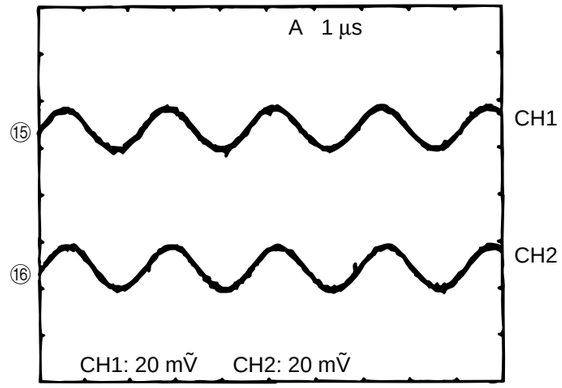
⑤ Reset signal
HD6433294A19F pin 3



⑫ Word clock WOK1
UPD6376GS pin 13

⑬ Data S1 (Note OFF)
UPD6376GS pin 15

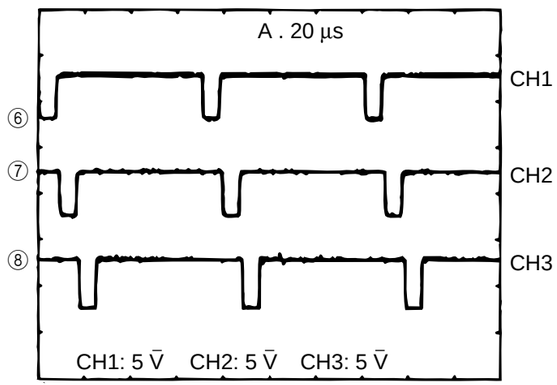
⑭ Bit clock BOK
UPD6376GS pin 16



⑮ Filter output AOR
JH connector pin 2

⑯ Filter output AOL
JH connector pin 1

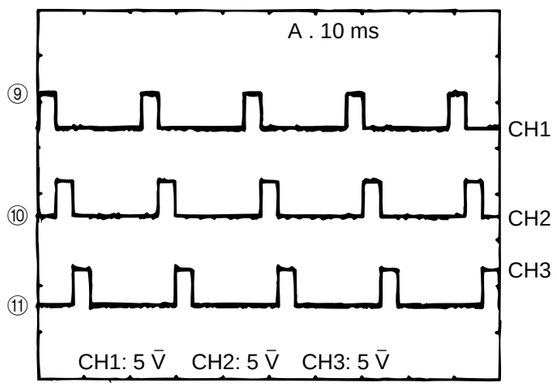
Tone: Whistle (No. 078)
Key: A4
Touch response: OFF



⑥ Key scan signal KC0
HG52E35P pin 44

⑦ Key scan signal KC1
HG52E35P pin 45

⑧ Key scan signal KC2
HG52E35P pin 46



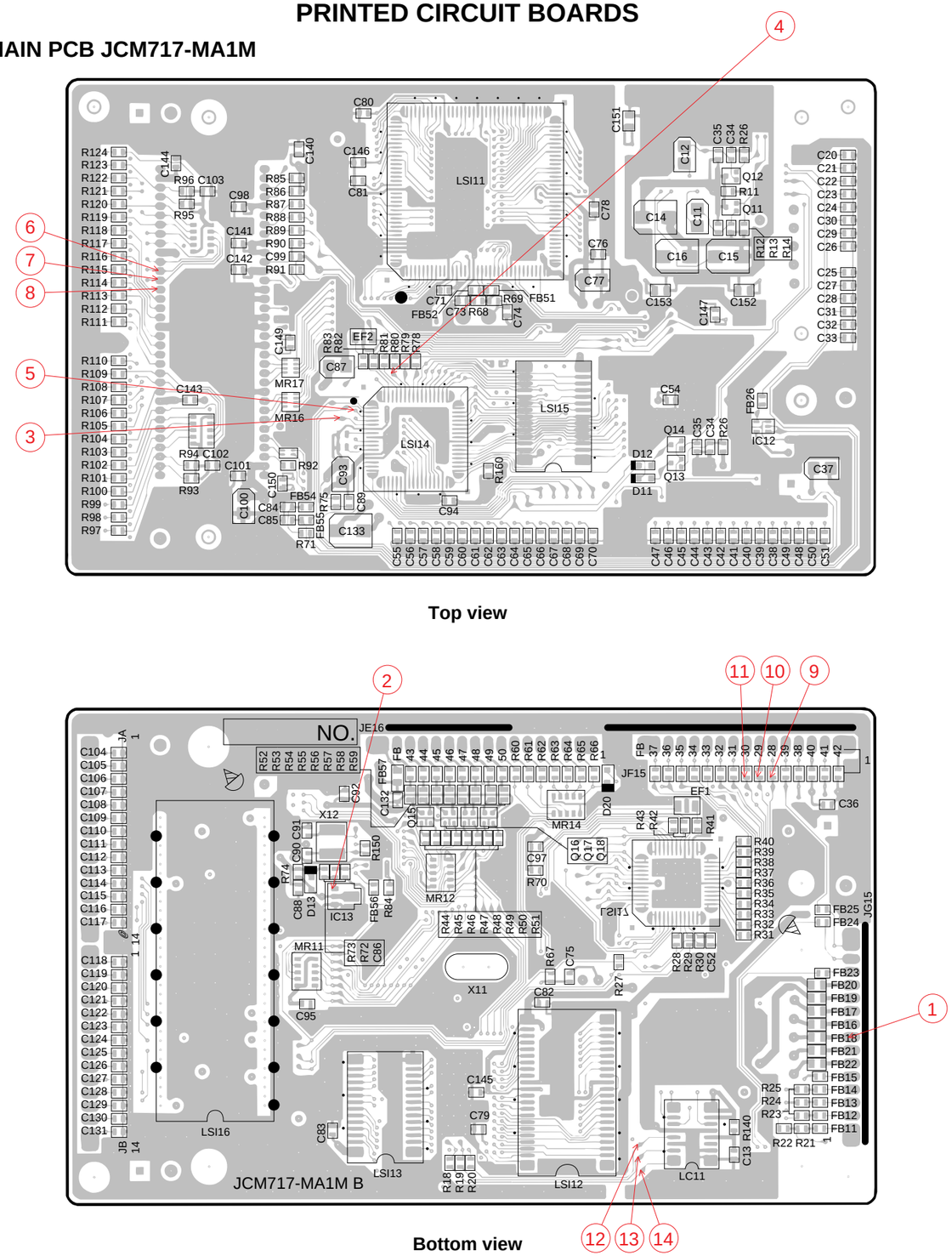
⑨ Button scan signal KO0
JE connector pin 6

⑩ Button scan signal KO1
JE connector pin 7

⑪ Button scan signal KO2
JE connector pin 9

PRINTED CIRCUIT BOARDS

MAIN PCB JCM717-MA1M

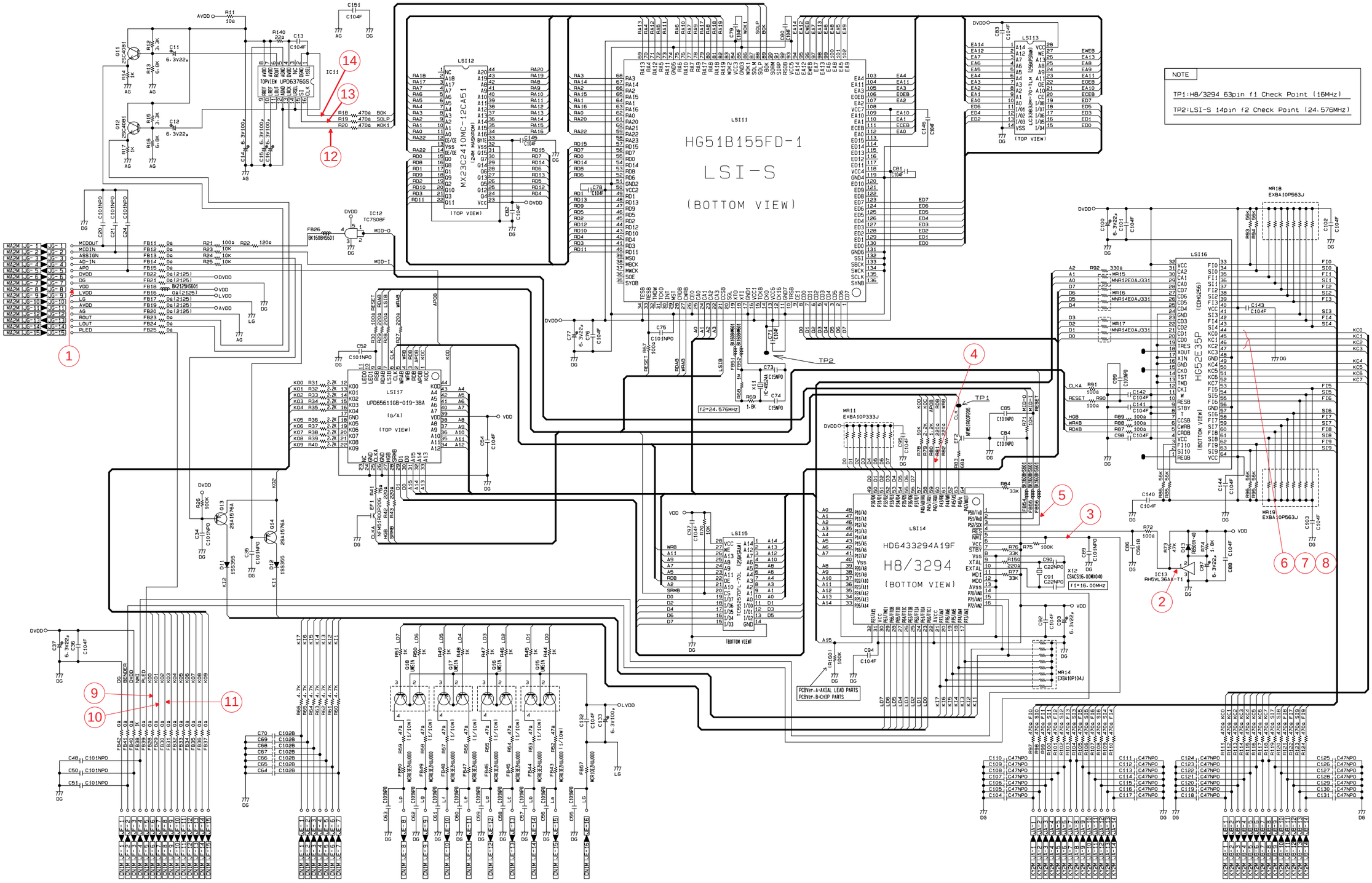


Top view

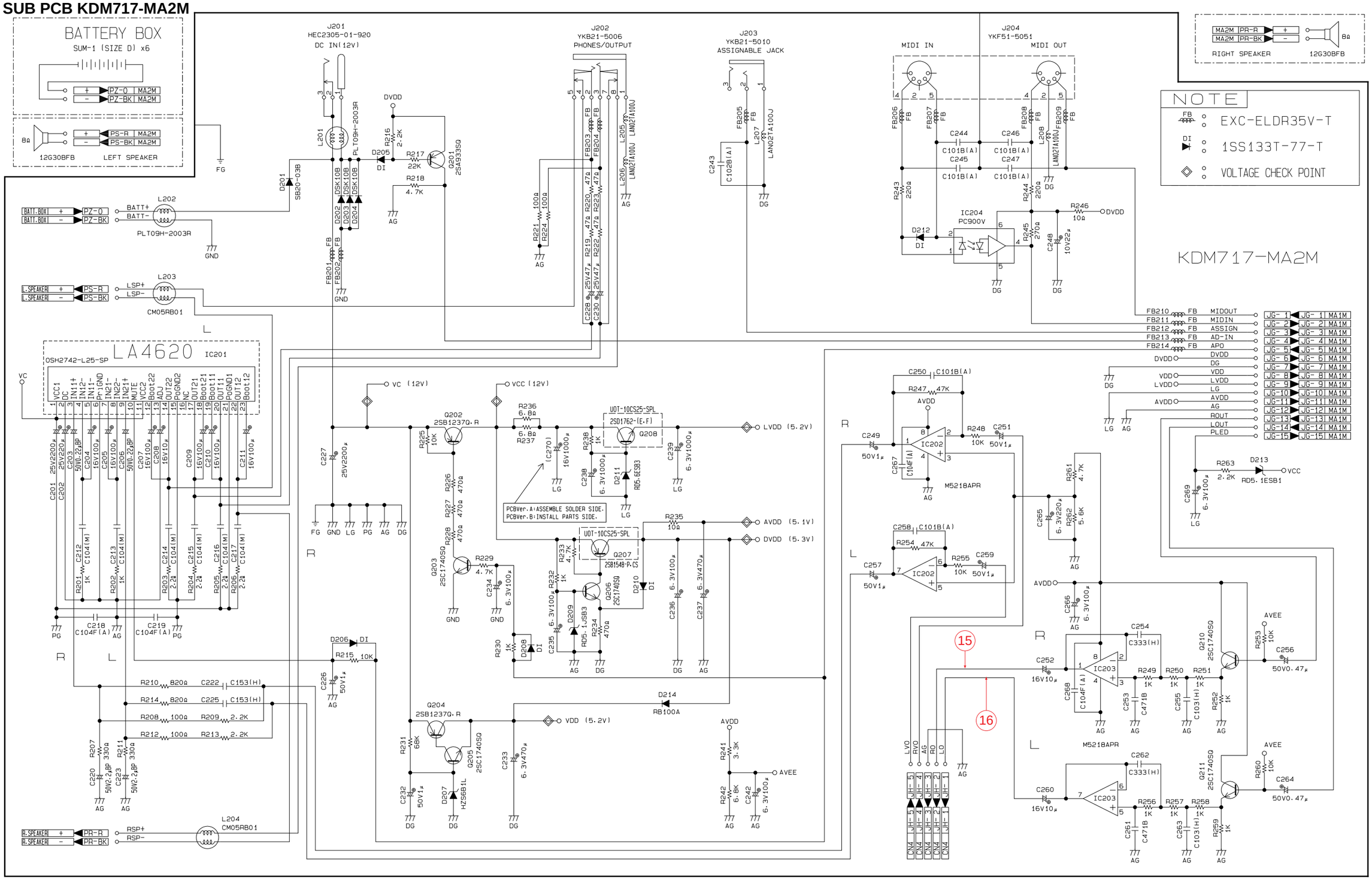
Bottom view

SCHEMATIC DIAGRAMS

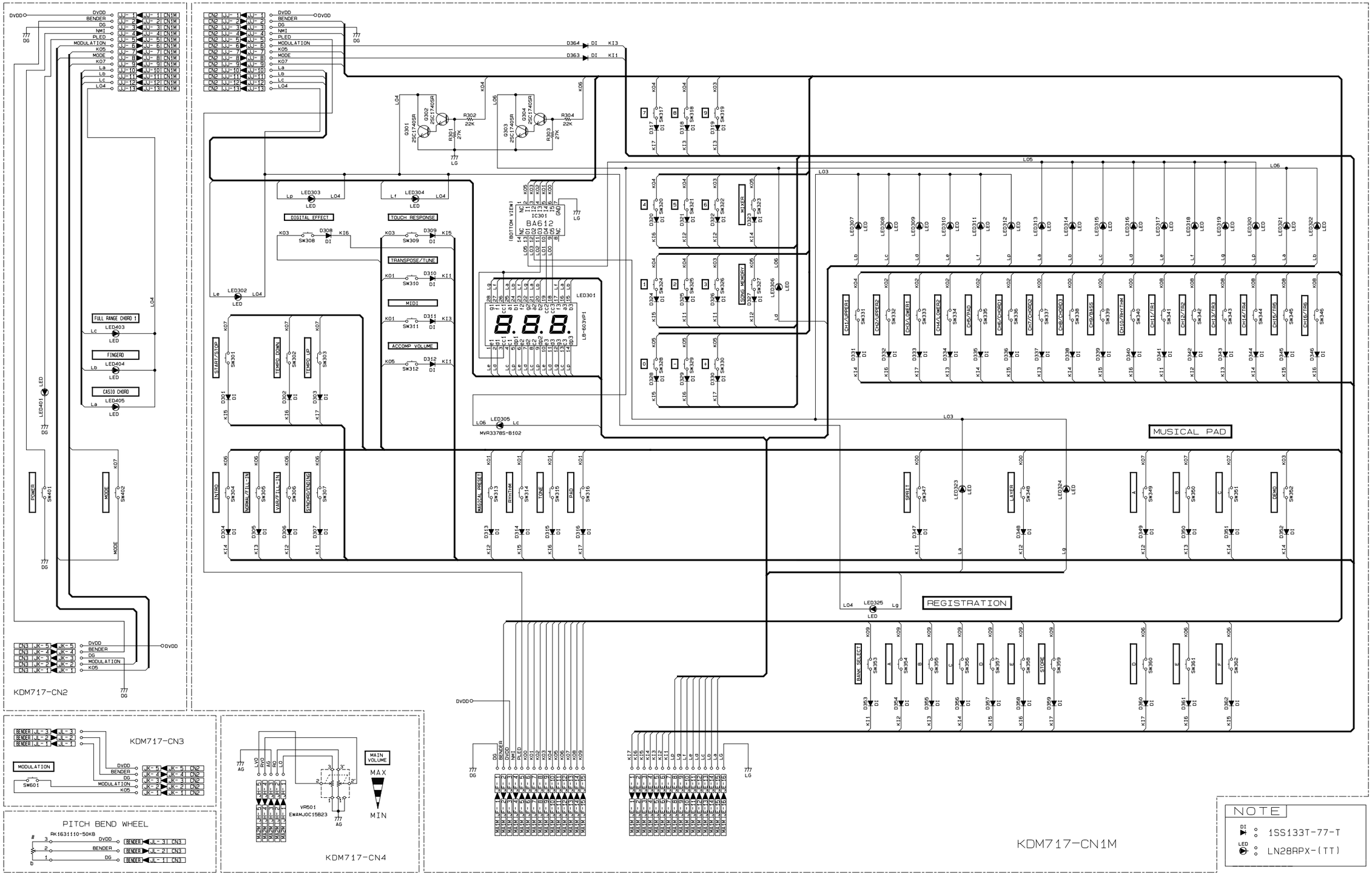
MAIN PCB JCM717-MA1M



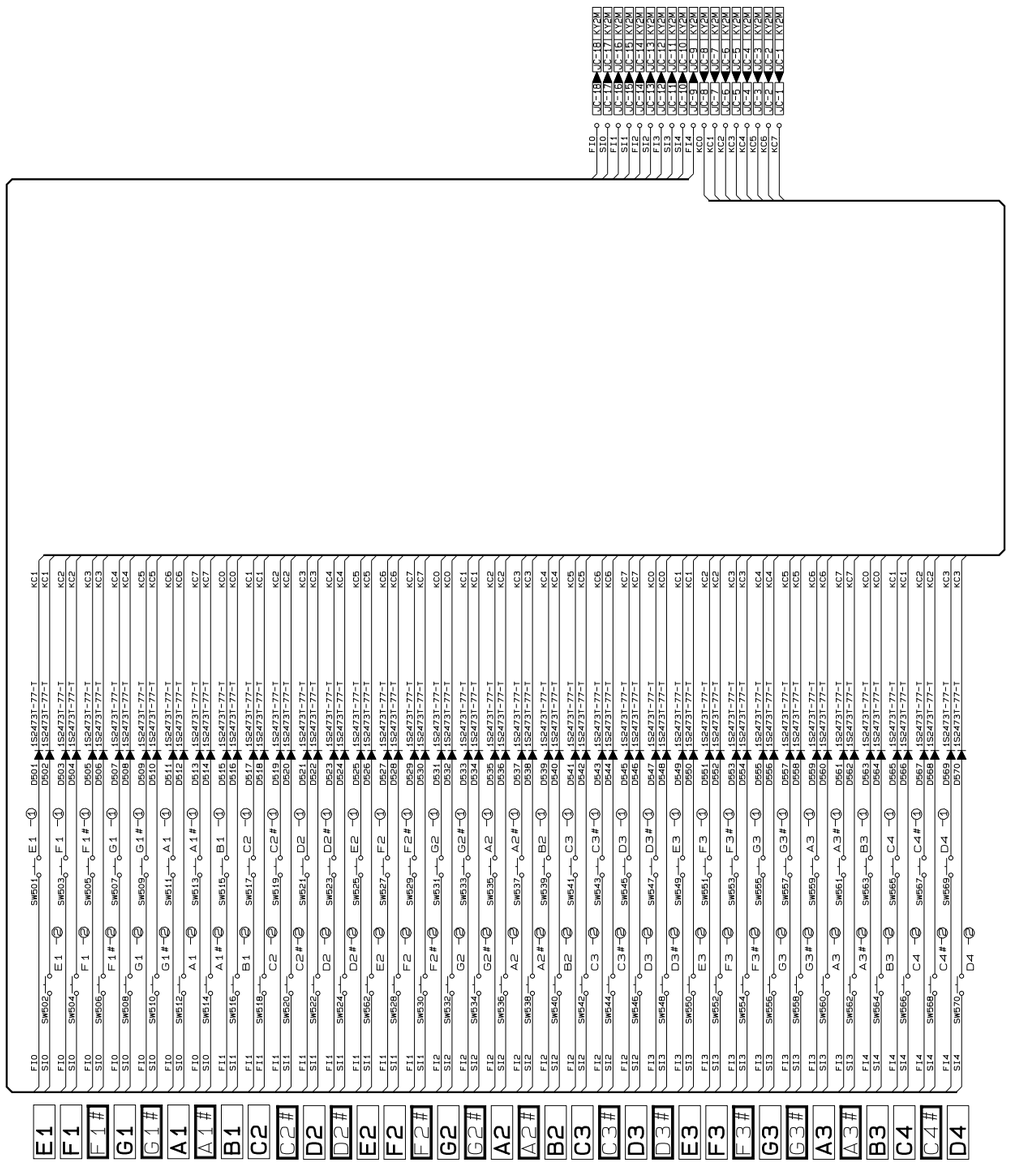
SUB PCB KDM717-MA2M



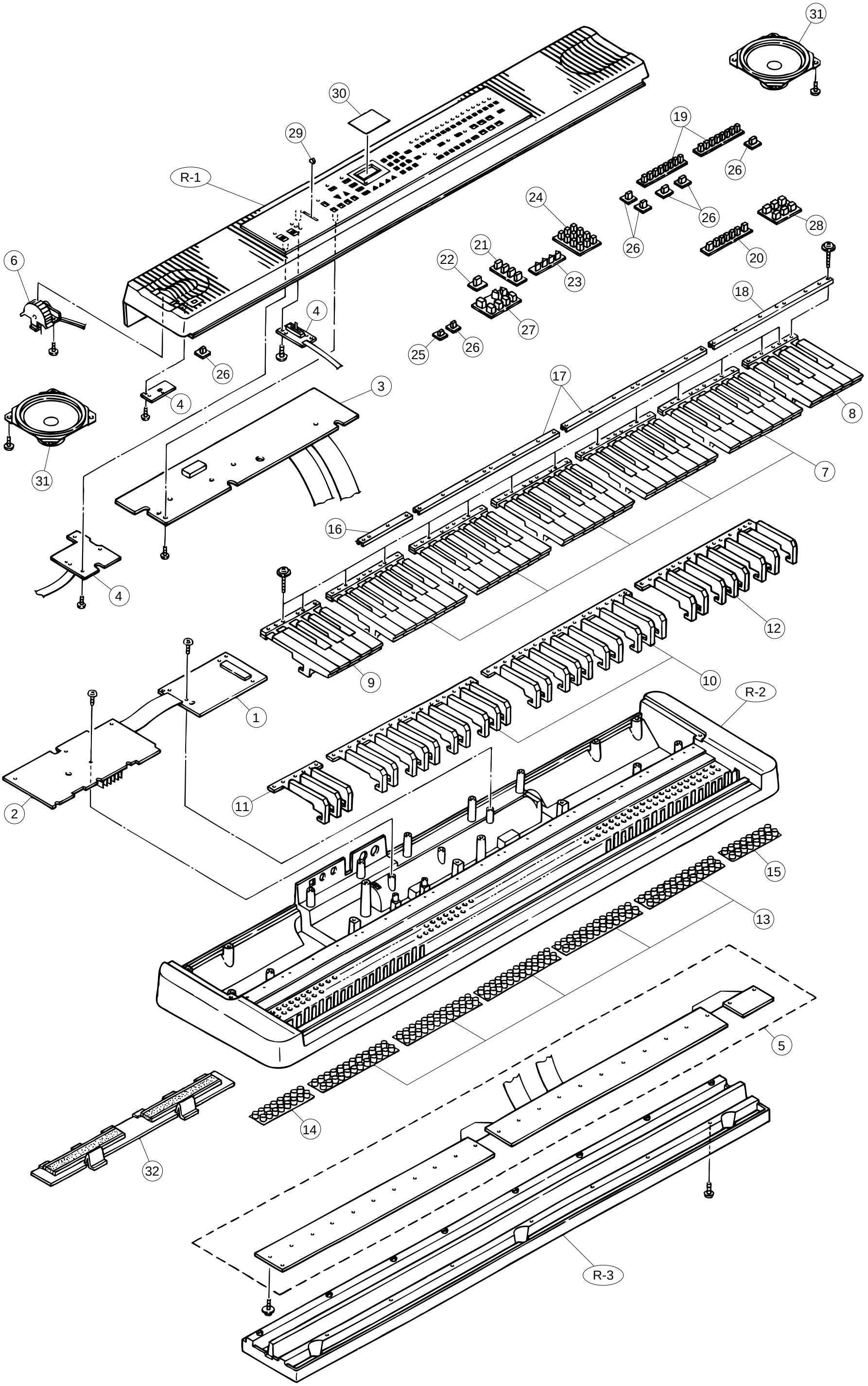
CONSOLE PCBs KDM717-CN1M/CN2/CN3/CN4



KEYBOARD PCBs JCM762T-KY1M/KY2M/KY3



EXPLODED VIEW



PARTS LIST

WK-1500

Notes:

1. Prices and specifications are subject to change without prior notice.
2. As for spare parts order and supply, refer to the "GUIDEBOOK for Spare parts Supply", published seperately.
3. The numbers in item column correspond to the same numbers in drawing.

MC-Service

Item	Code No.	Parts Name	Specification	Q	R
	Main PCB				
1	6925 3130	Main PCB ass'y, M717-MA1M	M140443*1	1	B
LSI2	2012 4536	LSI, ROM	MX23C2410MC-12CA51	1	A
LSI3	2012 0777	LSI, RAM	LC33832M-70-TLM	1	A
LSI7	2012 4298	LSI,	UPD65611GB-019-3BA	1	A
LSI11	2012 1316	LSI, DSP	HG51B155FD-1	1	A
LSI14	2012 4550	LSI, CPU	HD6433294A19F	1	A
LSI15	2012 4291	LSI, RAM	HM62256BLFP-7T	1	A
LSI16	2011 5194	LSI, Key controller	HG52E35P	1	A
IC11	2114 4221	IC	UPD6376GS-E1	1	A
IC12	2105 1120	IC	TC7S08F-TE85R	1	A
IC13	2105 4536	IC	RH5VL36AA-T1	1	A
Q11, Q12	2252 1169	Transistor, Chip	2SC4081-T106S	2	B
Q13, Q14	2250 1169	Transistor, Chip	2SA1576AT106S	2	B
Q15 - Q18	2259 2562	Transistor, Chip	UMS1NTL	4	B
D11, D12	2390 1820	Diode, Chip	1SS355TE-17	2	C
D13	2390 2576	Diode, Chip	RB501V-40TE-17	1	C
X11	2590 2107	Oscillator, Crystal	HC-49S24A	1	B
X12	2590 2079	Oscillator, Ceramic	CSACS16.00MX040-TC	1	B
	Sub PCB ass'y				
2	6925 3150	Sub PCB ass'y M717-MA2M	M140445*1	1	B
IC201	2114 1883	IC	LA4620	1	A
IC202, IC203	2114 1799	IC	M5218APR	2	A
IC204	2114 1421	IC	PC900V	1	B
Q201	2200 4409	Transistor	2SA933-SQ-TP-T	1	A
Q202, Q204	2251 0469	Transistor	2SB1237Q,R-TV6-T	2	A
	2220 1387	Transistor	2SC1740SQ-TP-T	5	A
Q207	2251 0672	Transistor	2SB1548-P.CS	1	A
Q208	2253 0455	Transistor	2SD1762E,F	1	A
D201	2390 1463	Diode, Schottky	SB20-03B	1	B
D202 - D204	2390 0371	Diode	DSK10B-BT-T	3	B
	2390 1344	Diode	1SS133T-77-T	5	C
D207	2360 1085	Diode, Zener	HZS6B1LTD-T	1	B
D209	2360 2261	Diode, Zener	RD5.1JSB3-T1-T	1	B
D211	2310 7775	Diode, Zener	RD5.6ESB3-T1-T	1	B
D213	2360 1134	Diode, Zener	RD5.1ESB1-T1-T	1	B
D214	2390 1323	Diode	RB100A-T32-T	1	B
J201	3501 5012	Jack, Power	HEC2305-01-920	1	A
J202	3612 0665	Jack, Phone	YKB21-5006	1	B
J203	3612 0789	Jack	YKB21-5010	1	B
J204	3501 4816	Jack, DIN	YKFB1-5051	1	B
	Console PCBs				
3	6925 3190	PCB ass'y M717-CN1M	M140444*1	1	B
IC301	2114 3318	IC	BA612	1	B
Q301 - Q304	2220 1387	Transistor	2SC1740SQ-TP-T	4	B
D301 - D364	2390 1344	Diode	1SS133T-77-T	64	C
LED301	2370 0952	LED, 7-segment	LB-603VP1	1	B
	2370 0343	LED	LN28RPX-(TT)	23	C
LED305	2370 1197	LED	MVR3378S-B102	1	C
4	6925 3180	PCB ass'y M717-CN2,3,4	M240469*1	1	B
LED401 - LED405	2370 0343	LED	LN28RPX-(TT)	5	C
VR501	2765 2128	Volume	EWAMJ0C15B23	1	B
	Keyboard PCBs				
5	6923 7630	Keyboard PCB ass'y	M140251*2	1	B
D501 - D652	2390 0252	Diode	1S2473T-77-T	152	C

Notes: Q – Quantity per unit
R – Rank

Item	Code No.	Parts Name	Specification	Q	R
	2765 1141	Volume	RK1631110-50KB	1	B
6	6925 3570	Knob, Bender	M31488-3	1	C
	Keyboard unit				
7	6922 2720	White key set, LT	M312118*1	5	A
8	6923 7900	White key set, LT76R	M340231*1	1	A
9	6923 7910	White key set, LT76L	M340230*1	1	A
10	6922 2740	Black key set, LT10P	M111726-1	2	A
11	6923 7930	Black key set, LT-76-3P	M111726-3	1	A
12	6923 7940	Black key set, LT-79-8P	M111726-4	1	A
13	6922 2760	Key contact rubber, LT-CB	M211704-1	5	A
14	6923 7970	Key contact rubber, LT-EB	M240181-1	1	A
15	6923 8000	Key contact rubber, LT-CG	M240182-1	1	A
16	6925 3540	Gasket, 717L	M240455-1	1	C
17	6925 3550	Gasket, 717C	M240454-1	2	C
18	6925 3560	Gasket, 717R	M240453-1	1	C
	Panel unit				
19	6925 3350	Button, Rubber	M240452-1	2	B
20	6925 3360	Button, Rubber	M340497-1	1	B
21	6925 3370	Button, Rubber	M340498-1	1	B
22	6925 3380	Button, Rubber	M340499-1	1	B
23	6925 2510	Button, Rubber	M312081-4	1	B
24	6922 2660	Button, Rubber	M312088-1	1	B
25	6923 4980	Button, Rubber	M312122-2	1	B
26	6923 4990	Button, Rubber	M312123-2	7	B
27	6925 3390	Button, Rubber	M211727-4	1	B
28	6925 3400	Button, Rubber	M312131-2	1	B
29	6921 5030	Knob, Slide	M311859-1	1	B
30	6925 3330	Plate, Display	M340500-1	1	C
31	3831 0672	Speaker	12G30BFB	2	B
	Others				
32	6925 4120	Cover, Battery	M311164*10	1	B
	6925 3310	Music stand	M340523*1	1	B

Notes: Q – Quantity per unit
R – Rank